NOMINATION
of the
LAHONTAN VALLEY WETLANDS
Nevada, U.S.A
as
WETLANDS OF INTERNATIONAL IMPORTANCE
under the
RAMSAR CONVENTION

1. **Date this sheet was updated:** May 31, 2001

2. **Country:** United States of America

3. **Name of Wetland:** Lahontan Valley Wetlands

4. **Geographic Coordinates:** Latitude 39 14' 30" N. and Longitude 118 28' 45" and 119

5. **Elevation:** 1188 m - 1219 m

6. **Area:** 1,408 km^2 [10,118 ha (25,000 acres)of primary wetland habitat]

7. **Overview:**

The Lahontan Valley wetlands are located near Fallon, Churchill County, Nevada, U.S.A., about 70 miles east of Reno (Figure 1). The wetlands are bounded by Latitude 39 14' 30" N. and Longitude 118 28' 45" and 119. The area includes about 1,408 km^2 in the southern Carson Desert, the largest intermountain basin in the northwestern Great Basin. The historic Stillwater Marsh and Carson Lake are the two primary wetland areas totaling approximately 10,118 ha (25,000 acres) of primary wetland habitat.

The average historical wetland acreage of Stillwater Marsh and Carson lake is estimated to be 60,705 ha (150,000 acres; Kerley et al. 1993). The actual amount of wetland habitat present in any given year, depending on water availability, has varied in the past ten years from less than 400 ha (1,000 acres) to about 16,000 ha (40,000 acres). A program is underway to secure sufficient water rights to maintain a long-term average of at least 10,118 ha (25,000 acres) of wetland habitat in the Lahontan Valley, as mandated by the Truckee-Carson-Pyramid Lake Settlement Act of 1990 (P.L. 101-618).

8. **Wetland Type:**

Inland: L M **N** **O** **P** **Q** **R** Sp Ss Tp Ts

U Va Vt **W** Xf Xp Y Zg Zk(b)

Human-made: 1 2 **3** **4** 5 **6** 7 8 9 Zk(c)

Rough descending proportion by wetland type

R - Seasonal/intermittent saline/brackish/alkaline lakes
Q - Permanent saline/brackish/alkaline lakes
P - Seasonal/intermittent freshwater lakes
6 - Water storage areas
4 - Seasonally flooded agricultural land
3 - Irrigated land
O - Permanent freshwater lakes
W - Shrub-dominated wetlands
N - Seasonal/intermittent/irregular rivers/streams/creeks

9. **Ramsar Criteria:**

1 **2** **3** **4** **5** **6** 7 8

10. **Map of Site Included:** Yes, figures 1-3.

11: **Name and Compiler of this form:**

Rob Bundy
Wildlife Biologist
Stillwater NWR Complex
P.O. Box 1236
Fallon, NV 89406
(775) 423-5128 Off
(775) 423-0416 fax
rob_bundy@r1.fws.gov

12: **Justification of the criteria selected on point 9:**

12(1): **Representation of a Terminal, Saline Marsh of the Great Basin.** Lahontan Valley wetlands are representative of a unique, closed basin, saline marsh system found primarily in the Great Basin. These marsh systems, located at the terminus of a river drainage with no outlet, are comprised of wetlands that range from fresh to saline water. Wetlands at the upper end of the marsh system contain fresh water from the inflowing

river. Water becomes increasingly saline toward the lower end of the system as evapo-transpiration proceeds while water flows through increasingly saline wetlands to the terminal basins. The lowest wetlands can be extremely saline (>100,000 μmhos/cm^2).

12(2): Importance to Endangered, Threatened, or Otherwise Sensitive Species.

Wetland Dependent Wildlife

Lahontan Valley wetlands are one of the most important wintering areas for bald eagles (*Haliaeetus leucocephalus*; federally listed as threatened under the Endangered Species Act) in the Great Basin. Lahontan Valley wetlands are also critically important to six Category 2 candidate species white-faced ibis *(Plegadis chihi)*, western snowy plover (*Charadrius alexandrinus)*, American white pelican (*Pelecanus erythrorhyncos)*, black tern (*Chlidonias niger)*, western least bittern (*Ixobrychus exilis*), and trumpeter swan (*Cygnus buccinator*). Category 2 candidate species are those that could become federally listed as endangered or threatened in the foreseeable future throughout all or a significant portion of their range. Each of these species is discussed in more detail below.

Threatened, Endangered, and other Sensitive Species:

White-faced Ibis (federally listed as a Category 2 candidate species): Lahontan Valley wetlands regularly support one of the three largest nesting colonies of white-faced ibis in North America. Approximately 5,000 pairs nest in the valley.

Western Snowy Plover (federally listed as a Category 2 candidate species): Snowy plovers are in a population decline throughout their western range. In 1980, Herman et al. (1988) concluded that the "Lahontan Valley is the single most important area for Snowy Plovers in the state of Nevada."

Black Tern (federally listed as a Category 2 candidate species): Black terns are uncommon nesters in Lahontan Valley wetlands.

Bald Eagle (federally listed as threatened): Lahontan Valley is the most important wintering area for bald eagles in Nevada. It harbors one-third to two-thirds of Nevada's wintering population. Numbers of wintering bald eagles using Lahontan Valley wetlands generally ranges from 20 to 50 birds. A peak of 70 eagles was observed in the winter of 1986-1987.

Trumpeter Swan (federally listed as a Category 2 candidate species): Trumpeter swans are rare migrants in the Lahontan Valley.

Western least bittern (federally listed as a Category 2 candidate species): There have been a small number of sightings of least bitterns in Lahontan Valley wetlands.

Threatened and Endangered Ecosystems

Noss et al. (1995) listed **Marshes in the Carson-Truckee area of western Nevada** as an endangered ecosystem which means that 85-98% of the ecosystem has been lost to changes in land use practices. Additionally, **riparian habitat** along the Carson river and Stillwater slough can be classed as threatened following the nationwide loss of 70-84% of these important ecosystems.

Designated Plant Community Types

The Nature Conservancy has developed a National Vegetation Classification System (Anderson et al. 1998) from which several globally significant plant communities were identified in the Lahontan Valley (Bundy et al. 1996). In this classification, conservation rankings range Eliminated (GX) to secure (G5) with 8 Lahontan Valley communities ranking as Imperiled (G2), Vulnerable (G3), or Apparently Secure (G4). These communities and rankings are as follows:

Salicornia rubra Herbaceous Vegetation	(G2)
Populus fremontii-Elymus triticoides	(G2?)
Allenrolfea occidentalis Shrubland	(G3)
Atriplex lentiformis Shrubland	(G3?)
Scirpus pungens Herbaceous Vegetation	(G2G4)
Scirpus maritimus Herbaceous Vegetation	(G4)
Elymus triticoides-Carex ssp. Herbaceous Vegetation	(G4?)
Distichlis spicata Mixed grass-Forb Herb. Veg..	(G3G5)

12(3): Importance in Maintaining Regional Ecological Diversity. Because of the scarcity of surface water in the Great Basin, wetlands are critically important for maintaining the region's ecological diversity. One factor that continues to pose a threat is diversion of water for agriculture and municipal uses, at the expense of wetlands at the bottom of the system. Over 85 percent of western Nevada's wetlands have been lost as a result of water diversions for farming and municipal uses. The scarcity of basin wetlands and the continued threat to many of the larger basin wetland systems greatly elevates the importance of each wetland that has assurance of long-term protection. At Stillwater NWR, a major portion of Lahontan Valley wetlands have long-term protection, and the Service has a legal mandate to restore and conserve natural biological diversity from P.L.101-618.

12(4): **Importance as habitat for critical stage In the biological cycles of plants and animals.** Lahontan Valley wetlands are critically important for several populations of waterfowl and shorebirds that migrate through the western Great Basin. Wetlands are scarce during spring and fall migrations, especially during prolonged droughts, and Lahontan Valley wetlands comprise a crucial link in the life cycle of waterfowl and shorebirds migrating across this otherwise arid landscape. The wetlands are especially important stop-overs for canvasbacks (*Aythya valisineria*), redheads (*Aythya americana*), long-billed dowitchers (*Limnodromus scolopaceus*), red-necked and Wilson's phalaropes (*Phalaropus lobatus* and P. *tricolor*), American avocets (*Recurvirostra americana*), black-necked stilts (*Himantopus mexicanus*), and least and Western sandpipers. Peak counts for shorebirds within the past 10 years in the Lahontan Valley were: 100,000 long-billed dowitchers, 64,000 American avocets, 66,700 least and western sandpipers, 67,000 red-necked phalaropes, 8,000 black-necked stilts, and 670 snowy plovers (Neel and Henry in press). This represents greater than 50% of the long-billed dowitcher population, and thus, was the focus for the Lahontan Valley Wetlands designation as a hemispheric site under the Western Hemispheric Shorebird Reserve Network (WHSRN).

Lahontan Valley wetlands also are important nesting areas for several species of waterfowl and shorebirds. They are the most important nesting areas for ducks and shorebirds in the western Great Basin. Important nesting species include cinnamon teal, redheads, gadwalls, American avocets, and black-necked stilts. Lahontan Valley wetlands contain the two most important snowy plover (Category 2 candidate species) nesting areas in the Great Basin, and regularly support one of the three largest nesting colonies of white-faced ibis in North America (approximately 5,000 pairs have nested in the valley).

Production of white pelicans nesting on nearby Anaho Island NWR depend on the Lahontan Valley wetlands as the primary source of food for adults that are feeding young. A peak of 10,000 white pelican pairs nested on Anaho Island in 1986.

Lahontan Valley wetlands, primarily those on Stillwater NWR, have at times supported over half of the Pacific Flyway population of canvasbacks during migration. More than 90 percent of the snow geese (*Anser caerulescens*) that migrate through Nevada make use of Carson Lake as a stop-over. The Lahontan Valley wetlands are also important to tundra swans (*Cygnus columbianus*), attracting up to 12,000 swans in some years, and are important migration stopovers for mallards (*Anas platyrhynchos*), northern shoveler (*A. clypeata*), green-winged teal (*A. crecca*), northern pintails (*A. acuta*), American wigeon (*A. americana*), and gadwalls (*A. strepara*).

12(5): The Lahontan Valley regularly supports well in excess of 20,000 waterfowl, even under prolonged drought. In excess of 175,000 waterfowl regularly stopover in the Lahontan Valley during migration each year, and peak populations of 475,000 have been recorded during good water years.

12(6): While actual population representation has been verified in few cases, it can be assumed that the Lahontan Valley wetlands support greater than 1% of the total population, in most years, for long-billed dowitcher (>50% in many years), western snowy plover, and canvasback. While the greater than 1% of a species population requirement is likely surpassed for other species as well, it is the diversity and numbers of wildlife species which best exemplifies the Lahontan Valley Wetlands.

12(7,8): The Lahontan Valley wetlands are subject to extreme drought and flood conditions which are representative of Great Basin wetland ecosystems, thus, perennial wetlands capable of sustaining native fisheries are at a minimum. However, Lahontan tui chub (*Gila bicolor obesus*), Lahontan speckled dace (*Rhinichthys osculus robustus)*, and Lahontan red-side shiner (*Richardsonius egregius*) can be found in most primary wetland areas. Competition with non-native fish such as European carp (*Cyprinus carpio*) and mosquitofish (*Gambusia affinis*) continues to be a problem.

Additionally, water rights acquisition and transfer at a reduced duty (2.99 vs 3.5 ac/ft per acre as per the 1995 Alpine Decree) and water management strategies presented in the Stillwater NWR draft Comprehensive Conservation Plan Environmental Impact Statement (CCP-EIS), would tend to benefit the endangered cui-ui (Chasmistes cujus) and threatened Lahontan cutthroat trout (*Salmo clarki henshawi*) in the adjacent Truckee River watershed. Cui-ui are found only in Pyramid Lake at the terminus of the Truckee river, but, Lahontan cutthroat trout are occasionally found in the lower Carson river system.

13: General Location: The Lahontan Valley wetlands are located near Fallon, Churchill County, Nevada, U.S.A., about 70 miles east of Reno (Figure 1). The wetlands are bounded by Latitude 39 14' 30" N. and Longitude 118 28' 45" and 119. The area includes about 845 square miles (1,408 km^2) in the southern Carson Desert, the largest intermountain basin in the northwestern Great Basin. The historic Stillwater Marsh and Carson Lake are the two primary wetland areas totaling approximately 10,118 ha (25,000 acres) of primary wetland habitat.

14: Physical Features:

The Lahontan Valley wetlands are within the Carson Desert hydrographic area (Rush 1968). The Carson Desert, otherwise known as the Lahontan Valley, encompasses an area of about 2,020 square miles (1.3 million acres) of nearly flat terrain. The Lahontan Valley consists of

unconsolidated fine-grained Pleistocene lake and playa deposits, young fan gravels, and prograding delta deposits of the quaternary period (Walden and Speed 1974). In general, soils range from sands to clay with medium textures. The soil-pore water and surface water in the Lahontan Valley typically are alkaline.

In general, the climate of the Lahontan Valley is arid, summers are hot, and winters are cold. In summer, night temperatures are characteristically cool. The average daytime maximum temperature during July-August, typically the hottest months, is about 91°F and the average daily low is about 52°F. Temperatures in July and August can exceed 100°F. The average daytime low temperature during December-January is about 18°F and the average high is about 46°F. The minimum temperature recorded since 1900 is -25°F and temperatures below 10°F are not uncommon. Annual precipitation ranges from one to nine inches and averages about five inches. An average of about two inches is received during February-May. Annual evaporation of surface water exceeds precipitation by about 12 to 1, due to the desert climate. Lahontan Reservoir, other Newlands Project regulating reservoirs, and the primary wetland areas show evaporative losses of 60 or more inches per year. The long-term average (1940 to 1990) evaporative loss rate for Fallon is 53 inches per year.

Geologic History

During the Pleistocene era northwestern Nevada was dominated by lake lahontan. Thirteen thousand years ago, the lake stood at 4,172 feet in elevation, coveringthe Lahontan Valley with up to 300 feet of water. At its greatest, the lake measured 886 feet deep and covered 8,422 square miles. It was maintained by melting glaciers of the Sierra Nevada. As the climate changed, evaporation exceeded inflow, and lake Lahontan receded until all that remained were the vestiges known today as Stillwater Marsh, Carson lake, Pyramid lake, and Walker lake.

Before Irrigation

The Carson River flows east from its headwaters in the Sierra Nevada to the Lahontan Valley. Before irrigation, the channel split at a point near the present location of the city of Fallon, with water flowing south into Carson Lake and north into the Carson Sink. When water primarily flowed south into Carson Lake, it first filled the lake and then overflowed into Stillwater Slough which flows north into Stillwater Marsh. This appears to have been the primary direction of water flow. When water primarily flowed north into the Carson sink, it first filled the Carson Sink and then backflowed into Stillwater Marsh.

The historical size of Lahontan Valley wetlands fluctuated from season to season and from year to year. Carson Lake is estimated to have varied from 25,000-38,000

acres; Stillwater Marsh from 0-22,250 ha (0-55,000 acres); and Carson Sink from 0-77,000 ha (0 - 190,000 acres; Kerley et al. 1993). The total average acreage of Lahontan Valley wetlands was about 60,700 ha (150,000 acres). Historical water quality of the wetlands was reported by Kerley et al. (1993) to be higher than at present, but accumulation of salts in the lower end of the wetland system occurred naturally.

Irrigation Project

The Newlands Irrigation Project has the distinction of being the first federally-funded irrigation project under the Reclamation Act of 1902. Construction of the project began in 1903. Approximately 22,250 ha (55,000 acres) of farmland are currently irrigated in the Newlands Irrigation Project.

By the early 1980's, the amount of water reaching the Lahontan Valley, including artificial supplementation from the Truckee River, was only about two-thirds of historical flows. Aside from abnormally high water years, very little water reached the Lahontan Valley without first having been used for irrigation. Lahontan Valley wetlands had been reduced from an annual average of 60,700 ha (150,000 acres) before the project to an annual average of 6,500 ha (16,000 acres) as a result of the irrigation project and use of water for municipal purposes,(Kerley et al. 1993).

The quality of water reaching the wetlands had also deteriorated substantially from pre-irrigation project conditions as a result of the Newlands Irrigation Project. The wetland's primary water source had become irrigation drainwater. Fish and bird mortalities and birth defects discovered in the Lahontan Valley wetlands during the 1980's prompted studies under the Department of the Interior's National Irrigation Water Quality Program to determine the effects of drainwater on wetland biota. These studies indicated that potentially toxic trace elements (arsenic, boron, mercury and selenium) and dissolved solids from study sites within Lahontan Valley exceeded Federal and State criteria for the protection of aquatic life, fish, and wildlife populations.

Toxicity attributed to the combined presence of selenium, arsenic, boron, lithium and molybdenum was established for several species of fish and invertebrates in some drains and wetland areas. Particularly high concentrations of these elements were entering the Stillwater NWR wetlands through two major drains, the T J Drain and Hunter Drain. (Hallock et al, 1993, Hoffman 1994).

15: Hydrological values:

An extensive system of wetlands exists in the terminal basins of the Lahontan Valley. , The wetlands basins comprise the terminus of the Carson River, which is fed primarily by snowmelt from the Sierra Nevada Mountains along the border of California and Nevada. Lahontan Valley wetlands are typical of Great Basin wetlands in that they, and the river system feeding them, do not have an outlet to the ocean.

The Lahontan Valley wetlands range from fresh (<40 - 500 μmhos/cm^2) to saline (45,000 - >100,000 μmhos/cm^2). The salinity of any particular wetland depends on its relative position along the chain of wetlands, from fresh snow melt high in the system to increasingly concentrated dissolved solids at the low end of the system as a result of evapotranspiration. Salinity levels are also heavily influenced by the salinity of irrigation drain water entering wetlands.

16: Ecological features:

Generally, the wetland plant communities within the Lahontan Valley wetlands fall into six main categories, each associated with different water depths and salinity levels. The categories are:

- **Submergent marsh** - Dominated by various species of pondweed, *Chara* and wigeon grass;
- **Deep emergent marsh** - Dominated by hardstem bulrush, cattail, pondweed, and duckweed;
- **Shallow emergent marsh** - Dominated by alkali bulrush, common three-square, and common cane
- **Moist-soil** - Dominated by five-hook bassia, swamp timothy, summer cypress, wild millet, smartweed, and red goosefoot;
- **Wet meadow** - Dominated by wirerush, sedges, spikerush, water clover, muhly grass, and saltgrass;
- **Shrub** - Dominated by greasewood, quailbush and saltgrass; or saltcedar with variable understories.

Three additional habitat types which typically are not vegetated include:

- **Unvegetated alkali mudflat;**
- **Deep-open water;**
- **Playa** - typically unvegetated but can include components of all previously mentioned types through longer periods of flooding.

The preceding list describes common plant communities occupying each wetland habitat type encountered in the Lahontan Valley with rough proportions (at Stillwater Marsh) for each habitat type and plant community provided in Table 1. Habitat types are arranged in order of decreasing water demands and water depth. While water depth and permanence generally dictate distribution of habitat types, other factors, such as salinity, regulate the plant communities and species which occupy a given

type. The following discussion provides descriptions of the wetland plant communities found within

Table 1: Wetland Plant Community Representation by Community Dominants and Community Type Among 21 Plant Communities Sampled on Stillwater NWR, Summer 1995.

Wetland Community Type	Community Dominant(s) *Scientific Name*	Common Name	Percent [a] (Community)	Percent (Wetland Type)
Submergent Communities				14%
	Potamogeton filiformis	Western pondweed	6%	
	Potamogeton pectinatus	Sago pondweed	2%	
	Ruppia maritima	Wigeongrass	4%	
	Zannichellia palustris	Horned pondweed	2%	
Deep Emergent Communities				19%
	Scirpus acutus	Hardstem bulrush	5%	
	Typha domingensis	Southern cattail	6%	
	Typha latifolia	Broad-leaf cattail	8%	
Shallow Emergent Communities				20%
	Phragmites australis	Common Reed	2%	
	Scirpus maritimus	Alkali bulrush	18%	
Wet Meadow Communities				4%
	Eleocharis macrostachya	Creeping spikerush	2%	
	Juncus balticus	Baltic rush	2%	
Grass Communities				21%
	Distichlis spicata	Saltgrass	20%	
	Muhlenbergia asperifolia	Muhly grass	1%	
Shrub Communities				8%
	Allenrolfea occidentalis	Iodinebush	4%	
?	*Sarcobatus vermiculatus*	Big greasewood	1%	
	Sarcobatus vermiculatus-	Big Greasewood-	1%	
	Suaeda moquinii	Torrey's seepweed	2%	
Tree Communities				1%
	Populus fremontii	Fremont Cottonwood	1%	
Annual Herbaceous and Invasive Communities				14%
	Bassia hyssopifolia	five-hook Bassia	12%	
	Various Annuals	various annual species	1%	
	Tamarix ramosissima	Saltcedar	1%	

each habitat type, the communities which may have been present historically, and possible reasons for any changes. All descriptions are based on intensive field surveys conducted during the summers of 1993 (Donohue and Baumgartner 1995), 1995 (Bundy et al. 1996), and 1997 (Charlet et al. 1997).

Ten species of invasive plants are currently found throughout the Lahontan Valley, three of which require immediate attention including saltcedar (*Tamarix ssp.*), Russian olive (*Eleagnus angustifolia*), and tall whitetop (*Lepidium perfoliatum*). Additionally, purple loosestrife (*Lythrum salicaria*) has been observed on the Truckee canal and Eurasian milfoil (*Myriphyllum spicatum*) has been observed in the upper Truckee river which often provides additional water to nearby Lahontan Reservoir. Russian olive does not appear to be spreading at present. Under existing conditions, tall whitetop is sporadically distributed at low densities but is increasing throughout the valley. A variety of government and non-governmental groups have combined efforts to combat invasive species in the Lahontan Valley with mixed, but positive results.

A recent inventory of the Lahontan Valley wetlands revealed the presence of 196 plant species, among which over 80 are non-native (Bundy et al. 1996). Additionally, an extensive literature search was conducted to examine the ecological character of the historic Lahontan Valley and the native plant species which likely became locally extirpated since the early 1900's (Nachlinger 1994). From these studies, estimates were provided on the likely occurrence of plant communities and their distribution among wetland habitat types in the pre-irrigation project Lahontan Valley (Table 2). Many communities have either been reduced in proportional representation (Broad leaf cattail, *Typha latifolia*; Hardstem bulrush, *Scirpus acutus*; Western pondweed, *Potomogeton filiformis*), or become locally extirpated (Great Basin wildrye, *Elymus cinereus*; coontail, *Certophyllum demersum*; and mixed meadow grasses), due to land use changes over the past century.

Certain species have responded to acquired water rights and the resulting freshening of the Lahontan Valley wetlands. Parish's spikerush (*Eleocharis parishii*) was only sampled in one small location (<1 ha) of the Lahontan Valley in 1993 and 1995 and was considered a potential species of management concern after this inventory effort. Following the floods of 1995-99, Parish's spike rush was found in several large (>10 ha, 25 acre) patches throughout the Carson river delta near Carson Sink. It would appear that most native species are still present in the soil seed bank and simply require the right wetland conditions for germination and survival. The seasonal and annual fluctuation in wetland water levels, common to Great Basin wetland complexes, is what leads to high productivity and plant diversity. This variation subsequently results in a diverse seed bank, with a variety of plants capable of germinating under conditions provided within a given year.

17: Noteworthy flora: See Section 12(2), Threatened and Endangered Ecosystems and 12(2), Designated Plant Communities.

18: Noteworthy fauna: See Section 12(2), Wetland Dependent Wildlife, Section 12(4), and Section 12(6).

Table 2: Representative plant associations thought to have occurred prior to 1900 in Lahontan Valley transitional upland, wetland, and riparian habitats, by relative coverage and frequency of occurrence.

Community Type	Transitional Upland Habitat	Basin-Wetland Habitats					Riparian Habitat
	Upland	Mud/Alkali Flat	Wet Meadow	Shallow Emergent	Deep Emergent	Submergent	Riparian
Community Dominant	Dry - Moist	Moist - 6"	Moist - 12"	6' - 24"	12" - 36"	12" - 48"	0" - 48"
Tree and tall Shrub Communities							
Fremont Cottonwood	Absent	Absent	Absent	Absent	Absent	Absent	**Common**
Fremont Cottonwood/Great Basin Wildrye	Absent	Absent	Absent	Absent	Absent	Absent	**Common**
Red Willow	Absent	Absent	Absent	Absent	Absent	Absent	**Common**
Sandbar Willow	Absent	Absent	Absent	Absent	Absent	Absent	**Common**
Wetland Shrub Communities							
Big Greasewood	**Common**	Rare	Absent	Absent	Absent	Absent	Present
Big Greasewood - Dotted Dalea	**Common**	Absent	Absent	Absent	Absent	Absent	Rare
Big Greasewood - Torrey's Seepweed	**Common**	Rare	Absent	Absent	Absent	Absent	Rare
Iodine Bush	**Common**	Present	Absent	Absent	Absent	Absent	Absent
Torrey's Seepweed	**Common**	Present	Absent	Absent	Absent	Absent	Absent
Transitional Upland Shrub Communities							
Big Sagebrush	**Common**	Absent	Absent	Absent	Absent	Absent	**Common**
Quailbush	**Common**	Absent	Absent	Absent	Absent	Absent	**Common**
Rubber Rabbitbrush - Dune Horsebrush	**Common**	Absent	Absent	Absent	Absent	Absent	Present

Community Type	Transitional Upland Habitat	Basin-Wetland Habitats					Riparian Habitat
	Upland	Mud/Alkali Flat	Wet Meadow	Shallow Emergent	Deep Emergent	Submergent	Riparian
Community Dominant	Dry - Moist	Moist - 6"	Moist - 12"	6' - 24"	12" - 36"	12" - 48"	0" - 48"
Emergent Communities							
Alkali Bulrush	Absent	Present	Present	**Common**	Present	Absent	Absent
Alkali Bulrush - Narrow-Leaf Cattail	Absent	Rare	Present	**Common**	**Common**	Absent	Absent
Broad-Leaf Cattail	Absent	Absent	Rare	Present	**Common**	Rare	Present
Common Reed	Absent	Rare	Rare	**Common**	Rare	Absent	Present
Common Three-Square	Absent	Present	Present	**Common**	Present	Absent	Absent
Hardstem Bulrush	Absent	Absent	Absent	Present	**Common**	Present	**Common**
Smooth Scouring Rush	Absent	Absent	Rare	Present	**Common**	Rare	**Common**
Narrow-Leaf Cattail	Absent	Rare	Rare	Present	**Common**	Rare	Present
Narrow-Leaf Cattail - Hardstem Bulrush	Absent	Absent	Absent	Present	**Common**	Rare	Present
Wet Meadow Communities							
Baltic Rush	Present	Present	**Common**	Absent	Absent	Absent	**Common**
Baltic rush - Creeping Spikerush	Absent	Present	**Common**	Absent	Absent	Absent	**Common**
Creeping Spikerush	Absent	Present	**Common**	Absent	Absent	Absent	**Common**
Creeping Spikerush - Water Hyssop	Absent	Rare	**Common**	Absent	Absent	Absent	**Common**
Parish's Spikerush	Unknown	Unknown	**Common**	Absent	Absent	Absent	**Common**
Grass Communities							
Alkali Muhly	**Common**	Absent	Rare	Absent	Absent	Absent	Absent
Baltic rush - Inland Saltgrass	Present	Rare	**Common**	Absent	Absent	Absent	Present
Great Basin Wildrye	Present	Rare	Rare	Absent	Absent	Absent	**Common**
Inland Saltgrass	**Common**	Present	Present	Absent	Absent	Absent	Present
Mixed Meadow Grass	Present	Rare	**Common**	Absent	Absent	Absent	**Common**

Community Type	Transitional Upland Habitat	Basin-Wetland Habitats				
	Upland	Mud/Alkali Flat	Wet Meadow	Shallow Emergent	Deep Emergent	Submerge
Community Dominant	Dry - Moist	Moist - 6"	Moist - 12"	6' - 24"	12" - 36"	12" - 48"
Submerged Aquatic Communities						
Chara	Absent	Absent	Absent	Rare	Absent	**Common**
Coontail	Absent	Absent	Rare	Rare	Rare	**Common**
Duckweed	Absent	Absent	Present	Present	**Common**	Present
Horned Pondweed	Absent	Absent	Absent	Present	Present	**Common**
Long-leaved pondweed	Absent	Absent	Absent	Present	Present	**Common**
Narrow-leaf Water Plaintain	Absent	Rare	**Common**	Present	Rare	Present
Sago Pondweed	Absent	Absent	Absent	Present	Present	**Common**
Water Hyssop	Absent	Rare	**Common**	Present	Rare	Present
Water Milfoil	Absent	Absent	Absent	Rare	Present	**Common**
Western Pondweed	Absent	Absent	Absent	Present	Present	**Common**
Wigeongrass	Absent	Absent	Absent	Rare	Rare	**Common**
Herbaceous Communities						
Dock	Present	**Common**	Present	Absent	Absent	Absent
Devil's Beggartick	**Common**	Present	Absent	Absent	Absent	Absent
Pickleweed	Absent	**Common**	Rare	Absent	Absent	Absent

Common - plant community would be indicative of habitat type; found in all years with high coverage
Present - Plant community would be found in habitat type but not in all years or in high coverage
Rare - Plant community might be present in habitat type but found in few years with low coverage
Absent - Plant community would not be found in habitat type (although representative species might under certain conditions)

19: Social and cultural values: The Lahontan Valley Wetlands contain some of the richest cultural resources in the Great Basin. Humans have flocked to Stillwater Marsh for millennia because, as excellent habitat for wildlife, the Stillwater area is an excellent place for people to live.

Archaeological evidence shows that human beings have lived in and around Stillwater Marsh for at least 12,000 years. The historic descendants of this legacy are the *Toedokado* or Cattail-eater Northern Paiute of Stillwater Marsh and vicinity. The *Toedokado* occupied an area bounded by the Humboldt Range to the north, Alpine Mountains to the east, Desert Range and south end of the Sand Springs Mountains to the south, and the Truckee and Virginia Ranges and the lower Carson River to the West. The modern descendants of the *Toedokado* are represented by the Fallon Paiute-Shoshone Tribe whose reservation borders are near Stillwater NWR to the east and Stillwater WMA to the north. Cultural resources in the Stillwater area remind us that people have been part of the American wildlife landscape not for a mere 100 years, but for at least 12,000 years.

Toedokado origin myths place Jobs Peak, located in the Stillwater Range, at the center of creation. From there, the first people were dispersed to Stillwater Marsh (among other places) which was filled with water by the tears shed by the Creator because of warring among his children (Fowler 1992). The explorers, settlers, and journalists who came into *Toedokado* territory all remarked on the vibrant

Indian population at Stillwater Marsh. The marsh was alive with Indians as much as it was with wildlife and fish. And, archaeological research has shown that the marsh has been a human landscape for thousands of years. Archaeological remains of *Toedokado* culture pervade the soil of every island, peninsula, and dune of the marsh. Even the barren playas have yielded evidence of the people.

The *Toedokado* were year-round residents of the marsh. They were not fleeting nomads who somehow eked out a living in a harsh environment. They understood the complexities of the ecosystem and were able to extract all the necessary food and raw materials to maintain a rich and thriving culture. For *Toedokado* descendants and members of the Fallon Tribe, the archaeological sites, sacred places, plants, and animals of Stillwater Marsh are basic elements of individual and group identity. Thus, the management of the Stillwater NWR and its cultural resources is of particular concern to the Fallon Tribe.

One of the salient features of Stillwater archaeology is an abundance of human burials (Brooks et al. 1987, Larsen and Kelly 199?). The flood of the mid-1980s revealed more than 4000 human bones representing at least 140 people. Overnight, the number of known archaeological human remains in the Great Basin doubled. It is safe to infer that hundreds more human burials lie just below the surface of greasewood-studded islands and peninsulas of the Stillwater wetlands. The archaeological pattern appears to be that any residential archaeological site may contain one or more human burials. The possibility of encountering human remains almost anywhere in and around the marsh is high. The exposure of burials does not require a massive erosion event like the flood of the mid-1980s. Localized wind or sheet wash erosion occasionally bring bones or a burial to the surface.

20: Land tenure/ownership:

The U.S. Government currently owns about 90 percent of the wetlands in the Lahontan Valley. Stillwater Marsh is located within the boundaries of Stillwater National Wildlife Refuge (NWR), administered by the U.S. Fish and Wildlife Service (Service). The refuge boundary also encompasses a private hunting club with about 1,200 ha (3,000 acres) of wetlands (approximately 15 percent of the Stillwater Marsh). The Carson Lake wetlands are under the jurisdiction of the U.S. Bureau of Reclamation, but are administered by the Nevada Division of Wildlife and the Truckee-Carson Irrigation District under terms of a two-party agreement. The agreement currently is being reevaluated with the intent that the area will be transferred to the State of Nevada as a Wildlife Management Area to be administered solely by Nevada Division of Wildlife.

21: Current land use:

Historically, farming, ranching, livestock production, and a rural lifestyle have characterized the social and economic environment in the study area. In recent years however, rapid population growth, increased commercial and light industrial development, and the expansion of the Naval Air Station-Fallon have changed Fallon and Churchill County. Generally, these changes represent a transition

toward a more urban lifestyle. Cities and towns within the study area are Fallon, Stillwater, and Hazen (Churchill County); Fernley (Lyon County), and Wadsworth and Nixon (Washoe County). Because the changes that could occur as a result of the alternatives being considered in this Draft EIS would not measurably affect the social and economic resources in the Truckee River Basin, the social and economic study area is limited to the lower Carson River Basin, most of which lies in Churchill County, Nevada.

Communities in the lower Carson River Basin, like much of Nevada, are experiencing population increases at a steady annual rate. Churchill County's population, for example, grew by more than 3 percent annually between 1990 and 1996 (U.S. Bureau of the Census and Nevada State Demographer) and almost 6 percent between 1996 and July 1, 1997 (Nevada Division of Water Planning, March 1998). In 1997, Churchill County's population base was approximately 23,860 residents, which included residents of the Fallon Paiute-Shoshone Indian Reservation. Fallon is the largest city in the county -- in which approximately 35 percent of the County's population reside. Growth is projected to continue at a rate of about 2 percent over the next five years.

More than 95 percent of Churchill County's 3.1 million acres is classified as fourth-class grazing lands or rangelands. Another 144,000 ha (355,000 acres) remain classified as agricultural. Most of the irrigated agriculture in Churchill County is in the Newlands Irrigation Project. The balance is classified as residential, industrial, and commercial. Expansion of the industrial, commercial, and residential land-use pattern is displacing prior land uses, typically agricultural (irrigated farm lands or grazing lands).

According to a report prepared by the University of Nevada, Reno (Department of Applied Economics and Statistics), the major employers in Churchill County are Federal, State and local governments; the service industry; and wholesale and retail trade. Federal, State and local governments account for nearly one-third of the jobs in the County. According to the Nevada Division of Water Planning (Churchill County Socioeconomic Overview, March 1998 with revisions), the service sector provides about 34 percent of the total jobs in the community. This is followed by wholesale and retail trade with 24 percent of the employment. Agriculture and its associated service sector account for an estimated 8 percent of jobs in the county, while construction provides 7 percent. Mining, manufacturing, transportation and public utilities, finance, insurance and real estate make up the remainder of employment in Churchill County.

22: Factors (past, present, or potential) adversely affecting the sites ecological character, including changes in land use and development projects:

The primary factor which has threatened the Lahontan Valley wetlands over the past century is land development. Around the turn of the century, the Newlands Irrigation Project was developed in the Lahontan Valley to redirect water in the Carson river for agricultural production. As the irrigation project grew and Lahontan Reservoir was developed on the Carson river above the Lahontan Valley wetlands, increasing demands on water flowing to the wetlands resulted in:

- Reduced volume and altered timing of inflows, and flow restrictions in Stillwater Marsh, and along the lower Carson River and its delta, as compared to natural conditions;

- Prevalence and spread of nonnative plant and animal species in wetlands, riparian areas, and uplands; and

- Altered chemistry of wetland inflows.

The first two are the major habitat issues that must be resolved or otherwise addressed in order to meet statutory requirements. Because several contaminants have been found to exceed thresholds associated with adverse effects to wildlife, contaminants are also of concern. These three problems are summarized in the following sections.

Reduced Volume and Altered Timing of Inflows, and Flow Restrictions

The major factor that has and continues to affect wetland wildlife and other components of natural biological diversity within the alternative boundaries of Stillwater NWR is altered hydrology. This includes significantly reduced volume (and rate) of water flowing into and through the lower Carson River and marshes, altered timing of water flowing through these habitats, and pattern of flow through the marshes. Of these, water volume is the most critical. Water volume has a major influence on fish and wildlife communities because of its effects on wetland-habitat acreage, water depth, and water chemistry. Even with the completion of the water-rights acquisition program (long-term average of 70,000 acre-feet/year), the volume of water entering Stillwater NWR will be far below the amount that historically flowed into Stillwater Marsh, an estimated average of 270,000 acre/year (Kerley et al. 1993). Also, the amount of water to enter Stillwater Marsh will be an estimated 5 acre-feet/acre/year (USFWS 1996a), as compared to an estimated average of 15-25 acre-feet/acre/year, which occurred under natural conditions [assuming 10,100 ha (25,000 acres) of wetland-habitat].

Following the construction of the Lahontan Reservoir and further regulation of the lower Carson River, inflow of fresh water directly from the Carson River into the Lahontan Valley wetlands was significantly reduced and drainage from agricultural areas became an increasingly larger component of the wetland water supply. Until the late 1960s, the wetlands received substantial amounts of water during the winter as a byproduct of winter hydropower generation. Increased irrigation efficiencies mandated under OCAP in the 1970's curtailed winter hydropower generation and further reduced the inflow of fresh water. The resultant dependence on drainwater resulted in a shift in water delivery patterns to wetlands, with inflows to wetlands corresponding to the release of irrigation water from Lahontan Reservoir over the agricultural growing season. Reduced inflow of water and diking disrupted the flow-through character and increased the amount of time that water remained in some wetland areas. Such changes reduced the frequency and efficiency of flushing of dissolved solids through the

wetlands. The high rate of evaporative water loss in this hydrologically-isolated basin has contributed to accumulation and concentration of dissolved constituents in wetlands (Seiler 1995). Concentrations of dissolved solids, including a variety of major and trace elements, was further elevated by the drainwater being received from agricultural drainage, including surface runoff from fields and subsurface drainage.

Some of the components of natural biological diversity that were adversely impacted by these changes include the number and abundance of migratory bird species breeding in Stillwater Marsh and along the Carson River, production of migratory birds and other wildlife, number of migratory birds using the area as a stopover, presence and abundance of certain species of invertebrates, overall extent of marsh vegetation, prominence of particular plant communities, and successional pathways. As compared with historic accounts, plant dominance has shifted to more saline-tolerant species and assemblages. In some cases, historically described saline intolerant plant associations, such as milfoil (*Ceratophyllum demersum*), no longer occur in Lahontan Valley (Bundy et al. 1996). Currently, dominant invertebrate species are moderately to highly-tolerant of salinity and altered water chemistry (Plafkin et al. 1989), contrasted with historic wetland conditions which included extensive areas of freshwater. Species sensitive to salinity and alkalinity are absent and overall number of invertebrate species is low.

Prevalence and Spread of Nonnative Plant and Animal Species

Another major factor impacting native wildlife and plant communities within the Stillwater NWR Complex is the introduction, continued influx, prevalence, and spread of certain introduced plant species (e.g., saltcedar in riparian and marsh habitats; and cheatgrass in uplands) and animal species (e.g., bullfrogs, European carp, and other fish in marshes; and cattle and European starlings in riparian areas). Saltcedar, for example, has had a significant impact on some plant communities within the Stillwater NWR Complex. Vast areas of meadow habitat once dominated by grasses, rushes, and sedges has converted to saltcedar-dominated communities with scant undergrowth. Monotypic stands of saltcedar are replacing mixed deciduous shrub/tree communities in riparian areas and emergent vegetation in marshes. Some plant communities have changed so much due to invasion of nonnative plants that they no longer resemble the original community. Seventy-two of the 192 wetland plant species now inhabiting Lahontan Valley wetlands (38 percent) are nonnative species; most of which are annual forbs and grasses (Bundy 1996). Introduced species are a major component of the area's biological diversity.

Altered structure of native plant communities due to cattle grazing has adversely impacted native wildlife and plant communities on the Stillwater NWR Complex (Appendix M). The long history of cattle grazing has contributed to the alteration of the natural structural diversity of vegetation, reduced the height and stature of native grasses, rushes, and forbs in meadow and riparian communities, which has shown to affect native bird and small mammal communities in

other areas, as summarized in Appendix M. This was also addressed in Charlet et al. (1997). Significantly reduced volumes and altered timing of Carson River flows is another factor that has contributed to deteriorated riparian conditions.

Cheatgrass is having a considerable impact on native plant communities in some upland areas of the refuge. Cheatgrass produces extensive ground cover in areas previously characterized by large proportions of open ground, which may affect species requiring spacing between plants (e.g., native lizards and kangaroo rats). Another attribute of cheatgrass-dominated communities is their propensity for frequent burning. This would have devastating impacts to native salt-desert shrub communities that evolved with very infrequent fires. Being an annual, cheatgrass thrives under frequent burning.

European carp, brown bullhead, largemouth bass, mosquito fish, and other nonnative fish dominate the fish communities in the Stillwater NWR Complex. A total of 15 introduced fish species occur in the Lahontan Valley, ~~compared to one native fish species that~~ only remains today, of the two species native to the valley. The composition of fish communities is significantly altered. Furthermore, European carp can adversely impact water turbidity and plant communities, and thus wildlife communities, of marsh ecosystems. Several species of introduced game fish inhabiting Stillwater NWR Complex have been shown to significantly affect populations of native invertebrates and amphibians in other areas. Largemouth bass can adversely impact waterfowl broods. Bullfrogs have been shown to significantly alter amphibian diversity in studied areas, and this may be a contributing factor to the marked decline in leapord frog populations in the Lahontan Valley. It may also be one reason why Western toads have not been recorded on the refuge. Bullfrogs could also be impacting the existing population of spade-foot toads. European starlings have had significant adverse impacts on native cavity-nesting birds throughout North America. They are aggressive competitors and likely have marked impacts on the ability of native cavity-nesting birds (e.g., wood ducks, American kestrels, northern flickers) to find suitable nesting sites along the lower Carson River.

Altered Chemistry of Wetland Inflows

A variety of environmental contaminant concerns have been identified on the Stillwater NWR. Contaminant concerns are primarily related to the historic release of mercury into the Carson River and its tributaries and the hydrologic modification of the lower Cason River basin. The historic release of mercury to the Carson River continues to affect the quality of water conveyed to Stillwater NWR, particularly during large upriver flood events. Other concerns involve potentially toxic trace elements. Previous investigations, prior to water rights being acquired for the wetlands, identified concerns with un-ionized ammonia, and 12 trace elements in water, sediment, and biological samples from Stillwater NWR. The trace elements aluminum, arsenic, boron, and mercury were identified as contaminants of primary concern. The environmental contaminant concerns in Stillwater NWR wetlands are largely attributed to

human modification of natural hydrologic characteristics and processes of wetlands, and wetland water supplies. Contaminants at concentrations identified in water, sediment, and biological samples from Stillwater NWR have the potential to produce a range of direct and indirect adverse effects to fish, wildlife, and habitat quality in Stillwater NWR. As proportionally more wetland inflow consists of irrigation-quality water and the proportional amount of drainwater inflows shrink, these contaminants will be of lesser concern.

Prior to the onset of the water-rights acquisition program, Hoffman et al. (1990) found that, water in Stillwater NWR has contained concentrations of arsenic, boron, dissolved solids, sodium, and un-ionized ammonia in excess of baseline conditions or Federal and State criteria for the protection of aquatic life or the propagation of wildlife. This has primarily been a consequence of receiving drainwater from agricultural areas, including surface runoff from fields and subsurface drainage, which commonly contains elevated concentrations of dissolved solids, including a variety of major and trace elements mobilized from soils or local groundwater. Concentrations of arsenic, boron, copper, mercury, selenium, and zinc in biological tissues collected from some affected wetlands exceeded levels associated with adverse biological effects in other studies. Organochlorine compounds were detected in sediments collected from wetlands of Stillwater NWR. Of greatest concern was lindane in normalized concentrations which exceeded the EPA sediment quality criteria in three samples. This study concluded that arsenic, boron, mercury, and selenium were of primary concern to human health and fish and wildlife in and near the Stillwater NWR. Subsequent studies have generally supported these findings (Lico 1992, Hallock and Hallock 1993, Tuttle et al. 1996, Tuttle et al. in preparation). Although the completion of the water-rights acquisition program will resolve these problems to a great extent, use of groundwater as outlined in the water-rights acquisition program could offset many of these gains (USFWS 1996a).

Under most conditions, environmental contaminants do not appear to threaten aquatic bird recruitment. For example, Hallock et al. (1993a) found that concentrations of arsenic, boron, mercury, and selenium in eggs from collection sites were below levels associated with embryotoxicity or reduced hatchibility. Consistent with these findings, hatching success of duck eggs collected from Lahontan Valley (90 percent) was within the range expected of healthy duck populations. However, Tuttle et al. (in preparation) found that boron in a majority of the sampled aquatic bird eggs exceeded a concentration associated with sublethal effects to hatchlings. Mercury in a third of the eggs exceeded concentrations associated with sublethal effects, while a limited number exceeded potentially embryotoxic levels. The magnitude of the contaminant problem in the Stillwater area remains unclear.

23: Conservation measures taken:

One of the primary objectives of P.L. 101-618, passed by Congress in 1990, is to restore and protect

the Lahontan Valley wetlands. The Secretary of the Interior, acting through the Service, is mandated by P. L. 101-618 to acquire sufficient water or water rights to sustain an average of 10,100 ha (25,000 acres) of wetland habitat in the Lahontan Valley. This will require acquisition of approximately 125,000 acre-feet of water because it takes about 5 acre-feet of water annually to sustain each acre of wetland habitat in the Lahontan Valley.

At present, the Service has been authorized to acquire up to 20,000 acre-feet of water rights from willing sellers. The Nevada Division of Wildlife (Division) and The Nature Conservancy are assisting in this effort. Thus far, the Service and Division have purchased nearly 10,000 acre-feet of water rights and have options to purchase nearly 10,000 acre-feet of additional water rights. These water rights, when acquisition and transfer is completed, will provide sufficient water to restore up to 1,600 ha (4,000 acres) of prime Lahontan Valley wetlands. An environmental impact statement (EIS) was being prepared to evaluate the impacts of securing sufficient additional water rights to reach the target of 10,100 ha (25,000 acres) of wetland habitat.

P.l. 101-618 (and other Federal laws) also mandate remediation of water quality problems that affect wildlife and wetlands. Water quality in the Lahontan Valley wetlands is improving as rights to more prime water (i.e., delivered irrigation water) are acquired and agriculture water-use regulations become more stringent. Acquisition of water rights is reducing the reliance on agricultural drainwater, and is allowing managers flexibility in timing water deliveries to the wetlands. In effect, prime water will dilute the drainwater that flows into the wetlands. Also, implementation of the 1997 adjusted Newlands Project's Operating Criteria and Procedures, aimed at increasing the efficiency of water use in agriculture, has resulted in less drainwater flowing to Lahontan Valley wetlands.

The National Irrigation Water Quality Program has moved into remediation planning for the drainwater problems identified in the initial studies. The Hunter Drain, a major contributor of toxic loads of trace elements to the Stillwater wetlands has been closed, and plans are being engineered for the disposal of T J Drain water. Furthermore, as part of the current water acquisition program for the wetlands, agricultural lands that contribute significant trace element runoff to the drainwater receive priority for purchase and withdrawal from agriculture to reduce contaminant loads to the wetlands.

Both the ecological (quality) and hydrological (quantity) characteristics of water available to the Lahontan Valley wetlands have improved significantly in the past 5 years, and the outlook for the future is bright. A draft contaminants monitoring plan has been developed and released for scientific peer review, which outlines an approach to closely monitor changes to the Lahontan Valley wetlands as we acquire further water rights and implement the previously described actions (Tuttle 2001). However, it is anticipated that the Lahontan Valley wetlands will be restored and will provide dependable, high quality habitat for waterfowl and other wetland dependent wildlife for many years to come as a result of P.L. 101-618.

24: Conservation measures proposed but not yet implemented: (e.g., management plan in

preparation; officially proposed as a protected area, etc.)

Public Law 101-618, identified the primary wetland areas in the Lahontan Valley including Stillwater NWR, Carson Lake and Pasture, and the Fallon Paiute-Shoshone Indian Reservation wetlands. Section 206 further identified the purposes for which these areas must be managed. The purposes of Stillwater NWR are to "*(1) restore and maintain natural biological diversity in the refuge; (2) conserve and manage fish and wildlife and their habitat within the refuge; (3) fulfill international treaty obligations with respect to fish and wildlife; and (4) provide opportunities for research, environmental education, and fish and wildlife oriented recreation*" (Section 206(b)(2), Public Law 101-618). Carson Lake and Pasture is to be managed *"in a manner consistent with applicable international agreements and designation of the area as a component of the Western Hemispheric Shorebird Reserve Network"* (Section 206(e), P.L. 101-618). Neither area currently has a management plan consistent with the purposes for which the area was established.

A Comprehensive Conservation Plan for the Stillwater NWR Complex (which includes most of Stillwater Marsh), was initiated in 1997 and is rapidly approaching completion. Once approved, this CCP will identify a new refuge boundary which will encompass the habitat diversity associated with Great Basin wetland complexes and will provide strategies to productively manage the marsh while providing opportunities for high quality wildlife oriented recreation as provided in the National Wildlife Refuge System Improvement Act (1997). This plan will guide the management of the refuge for the next 15 years.

25: Current scientific research and facilities:

A number of significant research studies have been conducted, or are ongoing, relative to the area's migratory bird populations, water quality , groundwater hydrology, and archeology. One of the purposes for which Stillwater NWR was established is for "...providing opportunities for scientific research..." (Public Law 101-618). Institutions and agencies that have been, or are, involved with research on the Lahontan Valley wetlands and associated resources include the U.S. Fish and Wildlife Service (now National Biological Service), U.S. Geological Survey, University of Nevada-Reno, University of Nevada-Las Vegas, and the Nevada State Museum.

26: Current conservation education: (e.g., visitors centre, hides, information booklet, facilities for school visits, etc.)

Environmental education and interpretation ~~are~~ is an important component of visitor services. Stillwater NWR ~~on~~ Refuge staff lead tours, conduct school educational outings, and provide assistance to visitors. The program ~~, lacking in the past,~~ has continued to grow over the last ten years as educational methods and materials are acquired and developed. Interpretive panels as well as staff-led talks and tours are currently undergoing extensive design and enhancement. Over 1,000 students and educators from a 150-mile radius have

benefitted from Stillwater's current programs.

Environmental education and interpretation has occurred within the Stillwater NWR since the management area was established in 1948. However, it has never been a priority consideration and was performed on an as-warranted, as staff time allowed basis. The program began to grow in the early 1990s corresponding to a heightened interest in the Lahontan Valley wetlands and in response to environmental education being named one of the purposes of Stillwater NWR. With the passage of the Refuge System Improvement Act, of 1997, these uses have taken on a new importance and will be facilitated at a much greater level.

27: Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency /intensity)

Most outdoor recreation in the study area occurs on public lands that are under the jurisdiction of the BLM, Bureau of Reclamation, and the Service, and State lands administered by the Nevada Division of State Parks and Nevada Division of Wildlife. Stillwater NWR and Carson Lake are the main structured recreational use areas in the Lahontan Valley. Unstructured recreational use also occurs at Newlands Project regulating reservoirs, Soda Lakes, Stillwater WMA, Fallon NWR, along the Carson River, and in the Carson Sink.

Wetlands offer opportunities for waterfowl hunting, wildlife observation, boating, and sightseeing. Some fishing occurs in these areas when water conditions are conducive to sustaining game fish populations, but a Nevada State Health Advisory has been issued cautioning against the consumption of fish in the Lahontan Valley. Wetland areas that provide opportunities for recreational use include Stillwater NWR, Stillwater WMA, Fallon NWR, and Carson Lake. Most available data relate to recreational use at Stillwater NWR, Stillwater WMA, and in Churchill County.

Although Carson Lake is a Federal property, it has been operated jointly by TCID and NDOW for the past 68 years. Access to the area is controlled by the Greenhead Club, a private gun club operating the area under a joint agreement with TCID and NDOW. The public is allowed access into the Carson Lake wetlands but the Greenhead Club continues to monitor and regulate use of the area. Current recreational use at Carson Lake wetlands is predominately waterfowl hunting. Pursuant to Public Law 101-618, the Secretary is authorized to transfer Carson Lake to the State of Nevada, and it is anticipated that the area will be transferred, managed and operated for wildlife by Nevada Division of Wildlife in the near future.

There are a number of other private gun clubs that own, or have exclusive access to, wetland areas used primarily for waterfowl hunting. The Canvasback Gun Club (Stillwater Farms), which is located on private lands within the Stillwater NWR boundary, is the largest of these gun clubs.

Newlands Project regulating reservoirs include Harmon, Sheckler, S-Line/Ole's Pond, Old River, Sagouspe, and Indian Lakes. Recreational use of the reservoirs is limited by water availability. These reservoirs are small (160 to 400 ha, 400 to 1,000 acres) and are managed as part of the Newlands Project. Recreation in these areas is a secondary use not specifically authorized as a Newlands Project purpose. Use of these reservoirs is generally unregulated, and people hunt, fish, boat, observe wildlife, hike, conduct dog trials, and operate radio-controlled boats and planes.

An average of 34,000 people visited Fallon and Stillwater NWRs and Stillwater WMA each year during the period of 1972-1998, ranging from 17,000 to nearly 50,000 per year.

28: Jurisdiction: (territorial, e.g., state/region and functional, e.g., Dept. of Agricuture/Dept. Of Environment, etc.)

See discussion in Section 20. The U.S Department of the Interior maintains primary jurisdiction over all primary wetland areas excluding the Canvasback Gun Club.

29: Management Authority: (name and address of local body directly responsible for managing the wetland)

Stillwater Marsh	Kim Hanson Project Leader Stillwater NWR Complex 1000 Auction Rd. Fallon, NV 89406
Fallon Paiute-Shoshone Tribal Wetlands	Robert L. Hunter Superintendent Bureau of Indian Affairs 1677 Hot Springs Road Carson City, NV 89706
Carson Lake and Pasture	Elizabeth Rieke Bureau of Reclamation 705 N. Plaza Street, Rm. 320 Carson City, NV 89701

Terry Crawforth
Nevada Division of Wildlife
1100 Valley Road
Reno, NV 89512

Canvasback Gun Club

John David Stanley Jr.
Canvasback Gun Club
P.O. Box 12984
Reno, NV. 89301

30: Bibliographical references: (scientific/technical only)

Hallock, R.J., H.L. Burge, and P.L. Tuttle. 1993a. Biological pathways: movement of selenium and mercury. Pages 39-53 *in* R.J. Hallock and L.L. Hallock (eds.), Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90; Part B. Effect on biota in Stillwater and Fernley Wildlife Management Areas and other nearby wetlands. U.S. Geological Survey Water-Resources Investigations Report 92-4024-B, Carson City, Nevada. 84pp.

Hallock, L. L. C.A. Janik, and L.L. Kerley. 1993b. Effects of boron, mercury, and selenium on waterfowl production. Pages 55-64 *in* R.J. Hallock and L.L. Hallock (eds.), Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90; Part 8. Effect on biota in Stillwater and Fernley Wildlife Management Areas and other nearby wetlands. U.S. Geological Survey Water-Resources Investigations Report 92-4024-8, Carson City, Nevada. 84pp.

Herman, S.G., J.B. Bulger, and J.B. Buchanan. 1988. The snowy plover in southeastern Oregon and western Nevada. Journal of Field Ornithology 59:13-21.

Hoffman, R.J. 1992. Summary of irrigation-drainage effects on water quality, bottom sediment, and biota. Part C, Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90. U.S. Geological Survey Water- Resources Investigations Report 92-4024-C, Carson City, Nevada. 32pp.

Kerley, L.L., G.A. Geoffrey, A. Ekechukwu, and R.J. Hallock. 1993. Estimated historical conditions of the lower Carson River wetlands. Pages 7-20 *in* R.J. Hallock and L.L. Hallock (eds.), Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90; Part 8. Effect on biota in Stillwater and Fernley Wildlife Management Areas and other nearby wetlands. U.S. Geological Survey Water-Resources Investigations Report 92-4024-8, Carson City, Nevada. 84pp.

Lico, M.S. 1992. Water quality, sediment composition, and hydrogeochemical processes in Stillwater and Fernley Wildlife Management Areas. Part A, Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90. U.S. Geological Survey Water-Resources Investigations Report 92-4024-A, Carson City, Nevada. 65pp.

Neel, L.A. and W.G. Henry. In press. The shorebirds of the Lahontan Valley Wetlands: historical perspective, Western Hemispheric Shorebird Reserve Network designation, and current management strategies. Proceedings of the December 1994 Shorebird Workshop, University of Nevada, Reno.

Rush, F.E. 1968. Index of hydrographic areas in Nevada: Nevada Division of Water Resources Information Report 6. 38pp.

Walden, R. and R.C. Speed. 1974. Geology and mineral deposits of Churchill County, Nevada. Nevada Bureau of Mines and Geology Bulletin 83. 95pp.

Additional References:

In addition to the literature referenced above and listed below, information was obtained from the 1948-1988 Annual Narrative reports of Stillwater National Wildlife Refuge (on file at the refuge office) and from the files of Nevada Division of Wildlife.

Alcorn, J.R. 1988. The birds of Nevada. Fairview West Publishing, Fallon, Nevada. 418pp

Fagan, J.L. and A.W. Raymond. 1987. Plan of action for cultural resource management at Stillwater Wildlife Management Area. Unpubl. Report, Army Corps of Engineers, Portland District; on file, U.S. Fish and Wildlife Service, Portland, OR.

Fowler, Catherine S. 1992. In the shadow of Fox Peak: an ethnography of the Cattail-eater Northern Paiute People of Stillwater Marsh. U.S. Fish and Wildlife Service Cultural Resource Series Number 5, U.S. Government Printing Office, Washington, D.C. 264pp.

Giles, LeRoy W. and David B. Marshall. 1954. A large heron and egret colony on the Stillwater Wildlife Management Area, Nevada. Auk 71 :322-325.

Hainline, James L. 1974. The distribution, migration, and breeding of shorebirds in western Nevada. M.S. thesis, University of Nevada, Reno. 141pp.

Linsdale, Jean M. 1936. The birds of Nevada. Pacific Coast Avifauna 23:1-145

Meyers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E.

Senner, and A. Tarak. 1987. Conservation strategy for migratory species. American Scientist 75: 19-26.

Osugi, Cathy T. 1973. Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Unpubl. Progress Report No.1; on file, Stillwater National Wildlife Refuge, Fallon, Nevada.

Simpson, James H. 1876. Report on exploration across the Great Basin of the Territory of Utah for a direct wagon-route from Camp Floyd to Genoa, in Carson Valley, in 1859. University of Nevada Press, Reno, Nevada, reprinted in 1983.

Thompson, S.P. and K.L. Merrit. 1988. Western Nevada wetlands: history and current status Nevada Public Affairs Review 1 :40-45.

U.S. Fish and Wildlife Service. 1948-1993. Stillwater National Wildlife Refuge Annual Narrative Report(s). On file, Stillwater National Wildlife Refuge.

U.S. Fish and Wildlife Service. 1985. White-faced ibis, management guidelines for Great Basin populations. Unpubl. report; on file, U.S. Fish and Wildlife Service, Portland, Oregon. 31pp.